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International application number: PCT/US04/043375

International filing date: 22 December 2004 (22.12.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/531,747
Filing date: 22 December 2003 (22.12.2003)

Date of receipt at the International Bureau: 09 February 2005 (09.02.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
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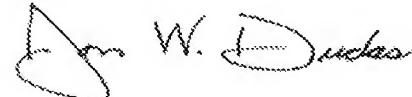
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RELATED PCT APPLICATION NUMBER: PCT/US04/43375

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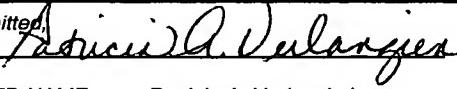
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

Express Mail Label No. EV395988801US

| INVENTOR(S) | | |
|---|--|---|
| Given Name (first and middle [if any]) Mark Alan Matthew Robert | Family Name or Surname Schultz Lamb | Residence (City and either State or Foreign Country) Carmel, Indiana Westfield, Indiana |
| <input type="checkbox"/> Additional inventors are being named on the _____ separately numbered sheets attached hereto | | |
| TITLE OF THE INVENTION (280 characters max) BIASED LENS MOUNTING FOR SEGMENTED DISPLAYS | | |
| CORRESPONDENCE ADDRESS | | |
| Direct all correspondence to: | | |
| <input type="checkbox"/> Customer Number | <input style="width: 100px; height: 20px; border: 1px solid black; border-right: none;" type="text"/> → | |
| OR | Type Customer Number here | |
| <input checked="" type="checkbox"/> Firm or Individual Name | JOSEPH S. TRIPOLI, THOMSON LICENSING INC. | |
| Address | PATENT OPERATIONS. | |
| Address | P. O. BOX 5312 | |
| City | PRINCETON | State NJ |
| Country | USA | Telephone 609-734-6834 |
| Fax | 609-734-6888 | |
| ENCLOSED APPLICATION PARTS (check all that apply) | | |
| <input checked="" type="checkbox"/> Specification Number of Pages | 5 | <input type="checkbox"/> CD(s), Number <input style="width: 50px; height: 20px; border: 1px solid black;" type="text"/> |
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| <input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76 | | |
| METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one) | | |
| <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. | FILING FEE AMOUNT (\$) | |
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| The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government. | | |
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| Respectfully submitted, SIGNATURE |  | Date | <input style="width: 100px; height: 20px; border: 1px solid black;" type="text"/> 12/22/03 |
| TYPED or PRINTED NAME | Patricia A. Verlangieri | REGISTRATION NO. (if appropriate) | <input style="width: 100px; height: 20px; border: 1px solid black;" type="text"/> 42,201 |
| TELEPHONE | 609 734-6867 | Docket Number: | <input style="width: 100px; height: 20px; border: 1px solid black;" type="text"/> PU030326 |

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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16018 US PTO
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1. Descriptive Invention Title: Biased Lens Mounting for Segmented Displays**2. Inventor(s) Information** (The first named inventor should be the primary contact for Patent Operations)

| | | | | | |
|-------------------|---------|--------------------|--------|------------------|---------|
| <u>First Name</u> | Mark | <u>Middle Name</u> | Alan | <u>Last Name</u> | Schultz |
| <u>First Name</u> | Matthew | <u>Middle Name</u> | Robert | <u>Last Name</u> | Lamb |

Brief summary of the invention

This invention provides a method to minimize distortion on segmented displays by varying the lens mounting on selected projectors to increase the quality of alignment in the more critical areas of the screen. Instead of every projector having the same lens mounting, each projector will have a lens mounting target based on where the projector is used in the segmented display.

Background

Distortion of all types create problems in aligning segmented displays. As the segments increase, the tradeoffs between seams get more difficult. This approach gives a method to help control the distortion on each lens to give an improvement in the overall picture. This shows a solution for the vertical direction while a similar solution is possible in two-dimensional arrays with both X and Y axis considerations.

When all of the projected images from segmented displays are perfect, the alignment is easy each segment. When lens, mirror, and screen distortions occur, the alignment becomes very complicated and tradeoffs must be made in the overall system response. Having the same lens and picture distortions on every projector may not deliver the best overall picture quality. Our approach is to use different types of distortion to our advantage.

Description of the Invention

Each projector has a lens, a mirror, and a portion of the screen that the image is projected on. We find that if we start on one edge in aligning projectors, by the time we get to the opposite edge of the screen, the distortion is so great that we can no longer obtain a satisfactory alignment. Our demo is using a 4:1 matrix, which contains three seams. Each projector has the same lens and the same mirror structure but the distortion varies from projector to projector.

This invention proposes to align individual projectors differently depending on where they are located in the array. Individual projection distortions are biased toward a desired pattern to decrease the distortion found within the seam area where the distortion is most noticeable by increasing the distortion in on the outer edges where the distortion is less noticeable. The details can be explained in the figures.

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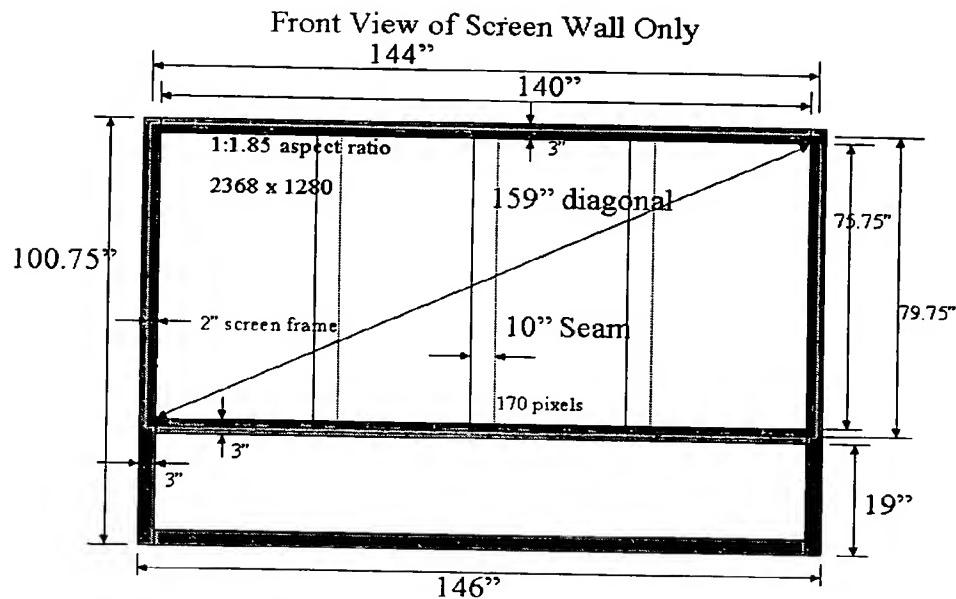


Figure 1

Figures 1 – 3 show the segmented display setup made up of four vertically mounted 16:9 displays.

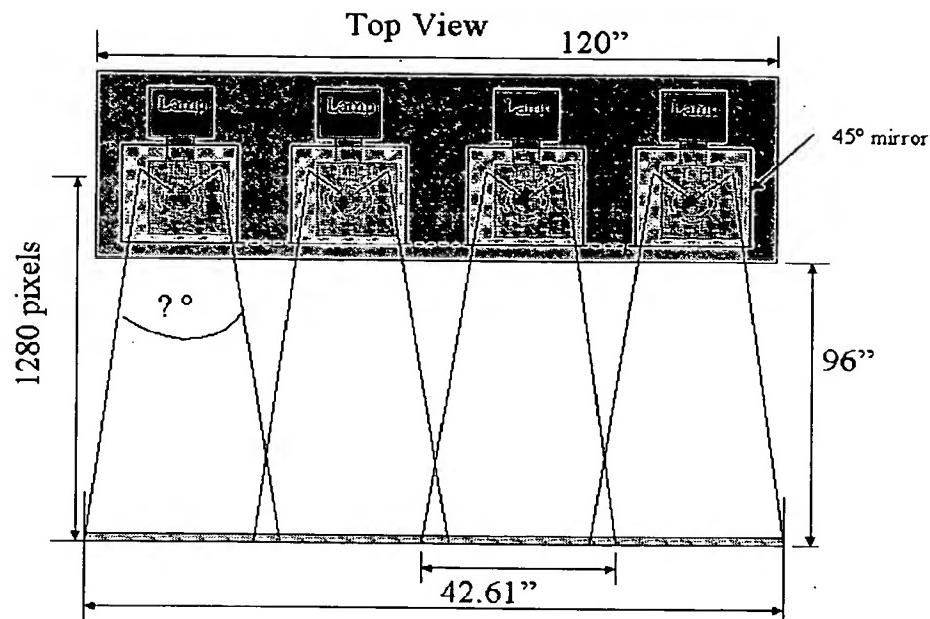


Figure 2

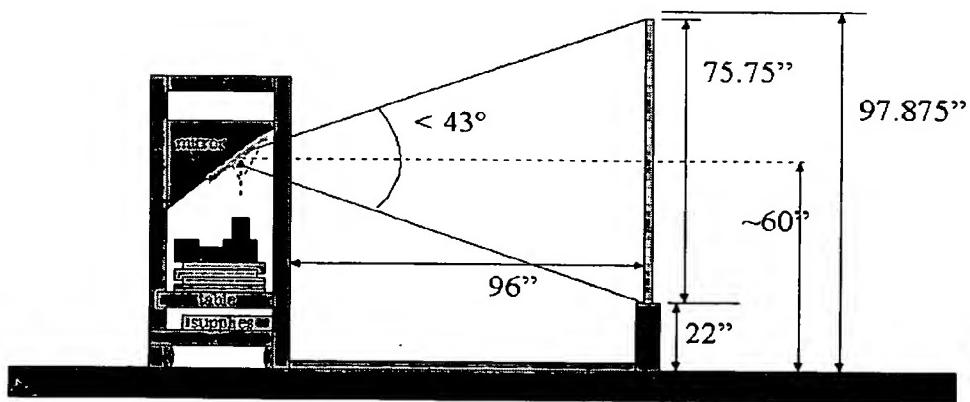
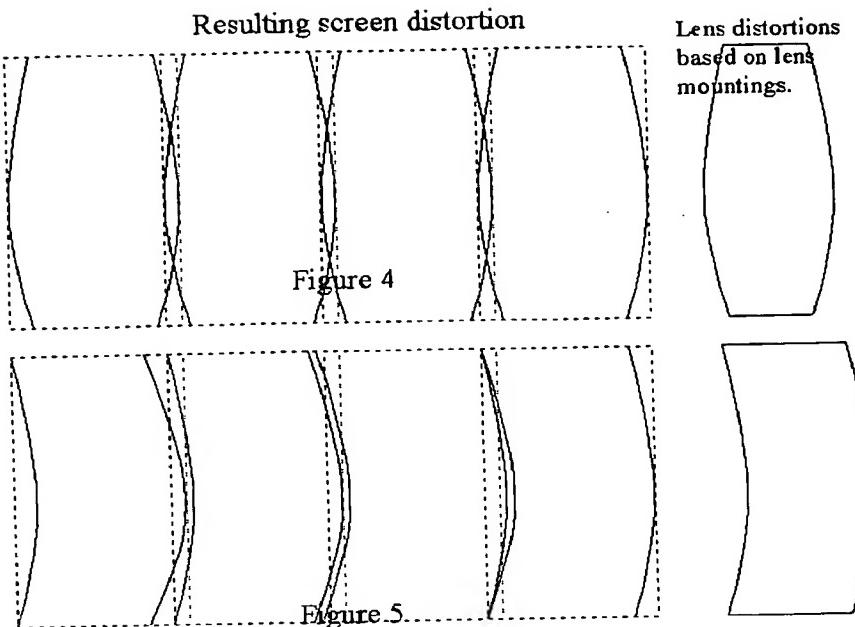
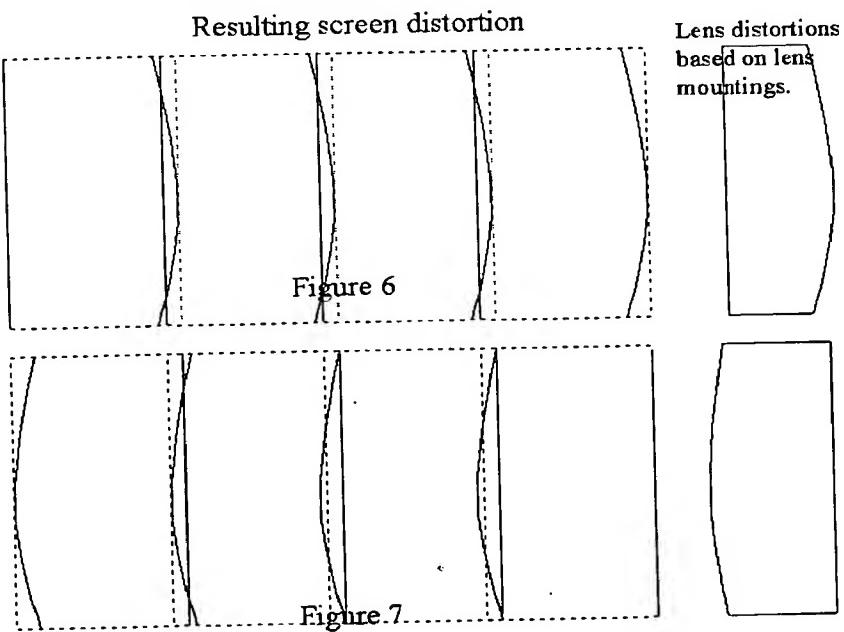
Side View

Figure 3



Figures 4-7 show typical distortions found on a single projector and the problems when trying to seam four projectors. The vertical and horizontal lines at the top become a problem in the seams. Some of this can be improved by using much more expensive optics but we hope our proposal delivers acceptable results using the lower cost lenses.



Some of these distortions are exaggerated to show the problems but all of them demonstrate the alignment issues found after all keystone problems have been corrected.

Our proposal is to align the projector on the left so that the right edge is as straight as possible where it is critical in the seam area as shown in Figure 6 and live with the left edge distortion since it is not very noticeable.

The two center projectors should be aligned to deliver a symmetrical distortion on each edge like Figure 4 since any alignment compromises to improve one side becomes a degradation on the other edge.

The projector on the right should be aligned to deliver a straight edge on the left side where it is critical in the seam area and live with the edge distortion on the right side where it is not very noticeable.

The result shown in Figure 8 is that the middle seam is unchanged but the two side seams have about 50 % of the original alignment distortion. The left and right edges will be worse but normally no one will even notice distortion on the edges.

